



Phytochemistry and Pharmacology of *Fumaria indica* (Fumitory) – A Review)

¹Sagar Ghumare, Pradnya Ghansawant, Mayur Gangurde

Student.

Student.

Assistant professor

Swami Vivekanand sanstha's Institute of Pharmacy Mungase, tal. Malegaon, Dist. Nashik.

Abstract : *Fumaria indica* (Hausskn) Pugsley (fumariaceae), known as “Fumitory” is an annual herb found all over plains of india, pakistan and central asia. This plant is used for isolation and polyherbal formulation. The plant is used in traditional systems of medicine like ayurveda, unani and TCM. According to review phytochemical constituents isolated from *fumaria indica* which are protopine, narceimine, narlumidine, methyle fumarate, fumariline, tetrahydro coptisine, etc. has important pharmacological activities like hepatoprotective, anti-inflammatory, antifungal, antibacterial, :

I. INTRODUCTION

In Ayurveda *fumaria indica* is known as pittappra and in unani it is known as shashtra. Ayurveda is the oldest and most popular health care system in india, ayurvedic medicinal system is widely used in Asiatic countries and recently they have also adapted by many other countries of the world. TCM (Traditional Chinese Medicine) is also well accepted in many parts of the world.

Many therapy relevant questions concerning medicinal phytochemistry and pharmacology of numerous ayurvedic and Chinese medicinal plants, cannot yet be properly answered in the terms of post modern concept of evidence based medicine. In many laboratories especially in Asiatic countries the commonly known more holiditic strategies an in vivo animal models for evaluating therapy relevant pharmacological properties herbs are still widely practiced. Recent efforts in our laboratories to define neuropsychopharmacological activity profiles of some indian medicinal plants.

Fumaria indica is the medicinal plant of fumitory species used in many traditional medical system's in india. It is commonly known by the name of “earth smoke, beggary, fumus, wax doll”[22]. in the regional languages of india fumitory is known by the different names such as, “pittappra” in Marathi, “shahterah” in Kashmiri, “tusha” in tamil, “pittapapdo” in gujrathi, “chata – rashi” in telugu, “parpata” in Sanskrit. These are annual weed's growing mainly in plain's and lower hills of india ,Pakistan, afganistan, turkey, iran and central asia.

It has many pharmacological activities like antipyretic, hepatoprotective, hypoglycemic, antidiarrheal, skin affection, antiplasmodic, antihelminthic, antieczema and antiperiodic compound.

Synonyms : pittahara, renu, rajorenu, charmakantaka, sookmapatra etc.

Properties : Guna – laghu, Veerya – sheeta, Rasa – tikta, Vipaaka – katu.

Taxonomy : Kingdom – Plantae

Division – Tracheophyta

Class – Magnoliopsida

Order – Ranunculales

Family – Papaveraceae

Tribe – Fumarieae

Subtribe – Fumariinae

Genus – *Fumaria*

Species – *Fumaria*

Botanical Distribution :

umaria indica is pale green in colour. It is a annual herb having many branches and it's average height is 61 cm long . stem is ridged having pale brown, brown in colour, smooth, hollow and about 3 - 4 mm thick and cylindrical. Leaves of *fumaria indica* are more or less green in colour, both surfaces of leaves are sedge green. Cauline leaves petiolate petiole is 0.8 – 6 cm long. Leaflets are 2-5 in number and pinnatisect; segment is long, linear or linear oblong, flate and acute. Pedicles are rarely 4.5 mm long and pedicles are thick at the apex than base. Sepals are about 1.5mm long and 0.5 – 1 mm broad. Flowers yellow, 4 – 6 mm long

including spurs downwardly curves, petal lobe is longer than spur lobe. Lower and upper petal tips are suborbicular while inner are coherent at the tips, lower are narrow. Stamens 6, diadelphous, 3 on each side of carpel. Filament 2.5 – 3 mm long, anther 0.2 – 0.5 mm long, middle anther ditheous and lateral monotheous. Carpel ellipsoid, glabrous, ovary 1 – 1.5 mm long, stigma is 0.5 – 1mm long, style 1.5 – 3 mm long. Corolla is 5 – 6 mm long and pink rose in colored. Fruit is about 2.5 mm broad, quadrate and sometime obscurely retuse[4,23].

Flowering and Fruiting period : March – June

Phytochemistry :

Initially report on isolation, structure elucidation and pharmacology of protopine and few other alkaloids isolated from *fumaria indica* in 1971[10]. After that the presence of many other alkaloids, flavonoids, glycosides, tannins, saponins, anthraquinones, steroids and terpenoids has been reported in different parts of the plant[19]. Extensive efforts has been done to separate and characterize number of compounds from leaf, stem, root and seeds of the plant . major constituents are protopine, fumariline, bicuculine, tetrahydro coptisine and methyl fumarate,etc. At the initial stage, seven isoquinoline alkalods have been separated from alcoholic extract of whole plant *f. indica*, this alkaloids include protopine, tetrahydro copticine, racemic mixture of bicuculine, fumarilicine and narceimine[10]. After that nona cosanol, sitosterol and quaternary salt of protopine were separated from the stem and leaves of *f. indica*[12].

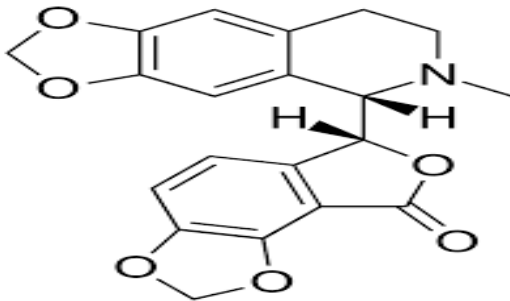
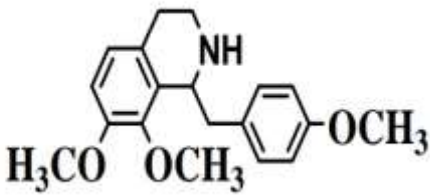
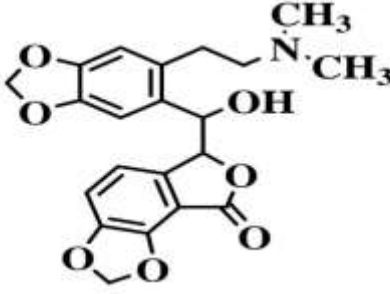
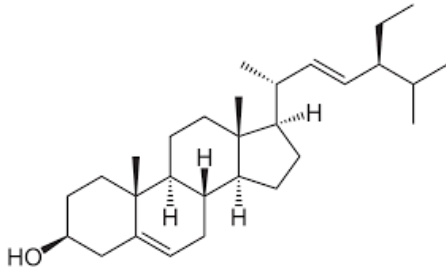
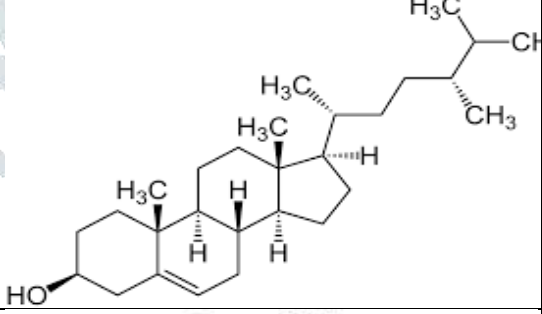
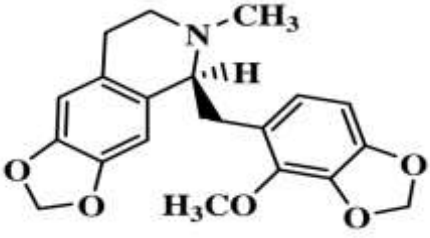
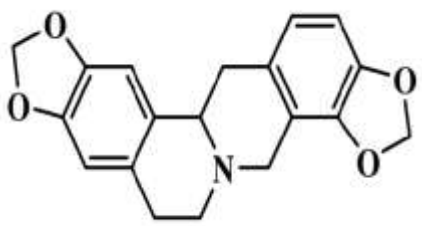
A group of benzyloisoquinoline alkaloids commonly known as protopine alkaloids are found in all parts of plant. Protopine alkaloid exist in two isomeric forms depending on the acidic environment[21]. The protopine alkaloid obtained from the seed is about twice of the whole plant and the tetrahydro coptisine content in seed is 50 times more than whole *fumaria indica* plant. Later is present as an optically active form in seeds rather than racemic mixture[9]. form in seeds rather than racemic mixture. *Fumaria indica* bears maximum concentration during the middle of its lifespan . major constituent protopine was found to maintain at highest concentration in first 20 days and then concentration decreases slowly and almost disappeared after 60 days[20].

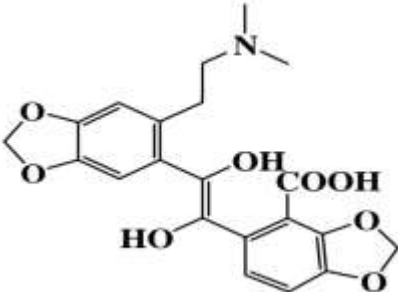
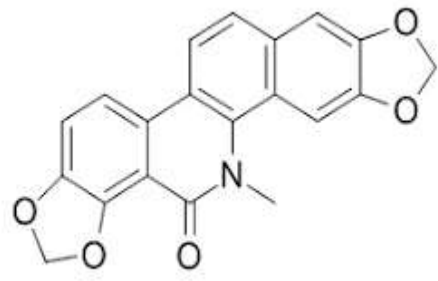
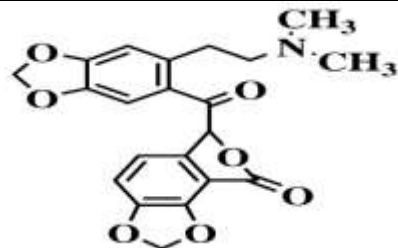
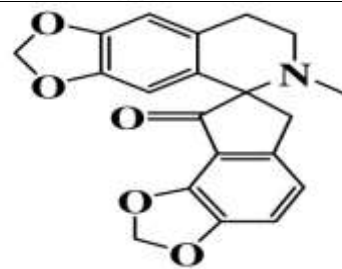
Phytoconstituents present in different part of *fumaria indica*

Plant Part	Phytoconstituents
Aerial part	Papracine, paprazine, sitosterol, stigmaterol, campesterol.
Root	Protopine, octacosanol, narceimine, narlumidine, adlumidine.
Leaf and Steam	Narlumicine, protopine, nonacosanol, narlumidine.
Seed	Fumariline, tetrahydro cortisine, bicuculine, oxysanguinarine.

Structures of phytochemicals :

Chemical constituents	Plant parts	Structure	Re f. No
Protopine	whole plant		6

Bicuculine	Whole plant		1
Fuyuzipine	Whole plant		1
Narlumicine	stem		6
Stigmasterol	Aerial Part and Whole plant		15
Campesterol	Aerial Part and Whole plant		15
Fumarizine	Aerial Part and Whole plant		17
Stylophine	Whole plant, stem and seed		6

Narceimicine	Seed		18
Oxysanguinarine	Seed		16
Narlumidine	Whole plant and stem		6
Fumariline	Whole plant and seed		16

Pharmacological Activities :

Pharmacological studies were conducted to study the major alkaloid present in the fumaria indica which is “protopine”. The tertiary alkaloid present in the fumaria indica has smooth muscle relaxant and hydrocholerretic activities.

II. SPASMOGENIC AND SPASMOLYTIC EFFECT

In vitro, due to the presence of the cholinergic and calcium channel blocker constituents, the crude extract of fumatory show’s the spasmogenic and spasmolytic effect. Which may explain the respective traditional use of fumaria indica in constipation and diarrhea[5].

Smooth muscle relaxant activity

To produce moderate to marked relaxation protopine was produced, At concentration of 0.5 -5.0 micro gm/ml protopine produce relaxation of the separated ileum of albino rat , guinea pig and rabbit Protopine relaxation activity is same as that of papaverine[10].

III. HEPATOPROTECTIVE ACTIVITY

Fumaria indica showed hepatoprotective activity against carbon tetrachloride, rifampicin and paracetamol induced hepatotoxicity in albino rats. The petroleum ether extract against the carbon tetrachloride total aqueous extract against paracetamol and methanolic extract against rifampicin induced hepatotoxicities showed similar reduction to that of “silymarin” known as hepatoprotective agent[14].

IV. ANTIBACTERIAL ACTIVITY

Fumaria indica plant has antibacterial activity against six bacterial strain's belonging to enterobacteriaceae, VIZ. Escherichia coli, klebsiella pneumonia, Salmonella typhimurium, enterobacter aerogenes and proteus vulgaris.

The result showed that Klebsiella pneumonia was most susceptible bacterium while salmonella typhimurium and escherichia coli were the most resistant bacterium[8].

V. ANTIFUNGAL ACTIVITY

Fuyuzipine is the alkaloid present in the plant of fumaria indica shows the antifungal activity against spore germination of some plant pathogenic fungi (collectotrichum sp, collectotrichum gloeosporioides, collectotrichum falcatum, curvularia lunata).

The germination of different fungi is significantly inhibited by fuyuzipine at 100-750 ppm. curvularia maculans and falcatum were inhibited at 1000 ppm for 24 hrs incubation[2].

VI. ANTI-INFLAMMATORY AND ANTINOCEPTIVE ACTIVITY

Fumaria indica shows dose dependant antiinflammatory activity in acute and chronic cotton models of inflammation in experimental animals and the extract also showed antinociceptive activity[19].

VII. CHEMOPROTECTIVE EFFECT

Fumaria indica shows chemopreventive effect by suppressing the tumour burden and restoring the activities of hepatic cancer marker enzyme on n- nitrosodiethylamine (NDEA) and carbon tetrachloride (ccl4) induced hepatocarcinogenesis in wistar rats[11].

VIII. ANTIOXIDANT ACTIVITY

Fumaria species contains some kinds of fatty acids with antioxidant effects. Antioxidant activity of ethanolic extract of fumitory was determined using DPPH (1,1-diphenyl-2-picrylhydrazyl) method. Free radical scavenging activity was recorded from fumitory which showed 61.8% activity[7,13].

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